

and by a range of hills, the Koh-Amir, from the Sistán Hamun. A ride performed under great difficulties across the Khara desert to the neighbourhood of the Sistán swamp placed all these points beyond doubt, so that the drainage system of the hitherto almost unknown region along the Perso-Baluch frontier, from the Lower Helmand to the Arabian Sea, has now been satisfactorily determined. From Sistán the travellers made their way by two new and parallel routes right across North Baluchistan to Jacobabad in Sind. The numerous topographical points recorded both here and throughout West Makrán are embodied in the accompanying map, which is on a large scale, and which forms an important contribution to our knowledge of the south-eastern section of the Iranian plateau. In the appendix are given the directions, distances, and other useful details of no less than twenty-two routes in the same region. The relief of the land and its salient physical features are also further illustrated by numerous sketches made on the spot by General Macgregor. Much valuable matter regarding the Baluchi and Brahui tribes, and the present political situation of Baluchistan, is scattered over the pages of this pleasantly written volume.

A. H. KEANE

PHYSICAL OPTICS

Physical Optics. By R. T. Glazebrook, M.A., F.R.S. (London: Longmans, 1883.)

THIS is the most recent volume of the well-known series of Text-books of Science published by Messrs. Longman. Mr. Glazebrook is already favourably known as an accurate experimenter and an able theorist in the subject of which this volume treats, and it is therefore unnecessary to say that the treatise under notice contains a large amount of authentic and interesting information on all branches of the subject. We must confess, however, to a certain feeling of disappointment after going through the book, arising chiefly from the fact that the author does not appear clearly to have made up his mind as to the class of readers to whom the book is to be useful. Those who have had any experience in real personal teaching of the artisans and students in science schools for whom the volumes of this series are stated to be intended, will soon perceive that Mr. Glazebrook has assumed an amount of mathematical knowledge and ability which very few of them possess. On the other hand results are occasionally assumed, the investigation of which would be quite within the reach of those university students who will probably form the larger part of the readers of the treatise. For instance, the investigation of the focal lines of a pencil refracted in a principal plane through a prism, and the condition of their coincidence in the position of minimum deviation, is settled by an "it may be shown," although the analysis required is certainly not more difficult than much that is given in the book, and the point to be elucidated is of considerable importance.

The author has intentionally introduced a large quantity of matter which is usually considered to belong to the kindred subject of Geometrical Optics, and although there will probably be a difference of opinion as to the advantage of this proceeding, there will be none as to the clearness of the explanations and the excellence of the diagrams

employed. There does not seem to be quite so much "matter new to the text-books" as is hinted at in the preface, but on the whole the book furnishes a good account of the subject, comparable with Lloyd's well-known treatise on the Wave Theory of Light, and dealing with many points which have been investigated since the date of the latter work.

Where there is so much of good, it is a pity that it should not be made better, and there are a few points in which perfection has not been reached. In places there is a tendency to a slipshod and "high-falutin" method of expression which may be forgiven in University Extension lectures delivered extempore to popular audiences, but which is hardly suitable for a scientific treatise. On p. 2 we have a graphic representation of the author raising his arm and of the effect thereby produced on his own body. Later on in the book, quitting the solitary first person, he becomes more friendly to his readers, and speaks of "our apertures, our lens, our prism, our eye," and so on. He even presently hands the apparatus entirely over to the reader and directs him to perform the operations for himself. A more serious matter is the want of care in revising the proofs. For instance, on p. 202 an effect is spoken of as "that due to a single aperture multiplied by a number of apertures," which is nonsense, the author's meaning being "multiplied by the number of the apertures." Again, on p. 141, the sentence—"They are distinct from the coloured rings of thick plates discovered by Newton, and were described by him as follows," gives an almost opposite meaning to that which the author intended. It ought to read "which were described."

The proper names are not treated with the accuracy and uniformity which are desirable. We have Fraunhofer usually, but on p. 316 Fraunhofer. Huygens appears on p. 15, but more frequently the name is met with as Huyghens, while the possessive case assumes the different forms of Huyghen's, Huyghens', and on p. 226 Huyghens's. Defects of this kind mar the pleasure with which the book would otherwise be read, and seem to indicate that more care might have been advantageously bestowed on the original composition as well as on the revision of the proofs. Possibly the author wishes to leave something to be looked for in the second edition, for the speedy arrival of which he has our best wishes.

OUR BOOK SHELF

The Year-Book of Pharmacy, 1882. 8vo. Pp. 607. (London: Churchill, 1883.)

THIS volume contains a number of exceedingly interesting papers and extracts. The most interesting are those which relate to the artificial production of organic alkaloids, for when we obtain such a knowledge of the constitution of these bodies as will enable us to make them artificially, we may hope that a new era will commence in medicine, and that the results of the treatment of disease will be more definite and satisfactory than heretofore.

Prof. Ladenburg, who has been engaged for some time on researches into those alkaloids which dilate the pupil, is still continuing his researches, and has obtained very interesting results indeed. Atropia when heated with strong hydrochloric acid splits up into a base, tropine, and an acid, tropic acid. While pursuing his investigations upon tropine, the author came to the conclusion that this base contained an alcoholic hydroxyl group

which possessed the exceptional property of forming fresh alkaloids, when treated with certain acids in hydrochloric solution as in the preparation from it of atropine and homatropine. By acting upon secondary amines by chlorhydrines, he has succeeded in obtaining a series of bases analogous to tropine, and yielding, like it, other basic compounds, which resemble natural alkaloids in their properties and composition. For these bases, which perform the function of alcohols and amines, the author proposes the name of *alcamines*, and for the basic ethers derived from them, that of *alcameines*. That resulting from the action of phenylacetic acid, for instance, has a composition represented by the formula $C_{15}H_{21}NO_2$, and forms crystallisable salts. It is a powerful poison, acting on the respiration and the heart.

A curious relation has been discovered between theobromine, the active principle of cocoa, caffeine, the active principle of tea and coffee, and xanthine, a substance found in muscle, and largely contained in beef tea and Liebig's extract.

Dr. Fisher shows that xanthine may be converted into theobromine, and theobromine into caffeine. The relation between these bodies seems to be that theobromine is dimethyl- and caffeine is trimethyl-xanthine.

From the great importance of the cinchona alkaloids and their extensive use in medicine, it is exceedingly desirable that we should be able to make quinine artificially. This has not yet been done, but, with a view towards it, extensive researches are being made into the constitution of the cinchona alkaloids; and Skrapu finds that all the four cinchona alkaloids—quinine, quinidine, cinchonine, and cinchonidine—when oxidised with potassium permanganate yield formic acid, and a base apparently related to phenol or carbolic acid. Other modes of oxidation exhibit a relation between quinine and cinchonine.

Cinchonine has been prepared artificially by treating a mixture of nitrobenzol, aniline, and glycerol with sulphuric acid. In its physiological properties it exhibits a certain relation to quinine, and, like it, reduces the temperature in fever and lessens or prevents putrefaction. It is said to differ from quinine in not producing giddiness, or ringing in the ears, and to have very little action on alcoholic fermentation.

An important paper by Plugge relates to the various strengths of aconitine. He finds that Petit's nitrate of aconitine has a poisonous action at least eight times greater than Meret's and 170 times greater than Friedländer's. Such differences as these between preparations bearing the same name have already led to fatal cases of poisoning—when aconitine has been prescribed medicinally; and Mr. Holmes considers that the only way to secure uniformity in the ordinary preparations of aconite is to prepare them only from plants grown in this country, and gathered while the plant is in flower.

In addition to many other interesting papers this volume contains a bibliography of chemistry, pharmacy, botany, and allied subjects.

Mémoires de la Société des Sciences Physiques et Naturelles de Bordeaux. 2^e Série, Tome v. 1^{er} Cahier. (Paris, 1882.)

In this number there are several interesting papers. We note "La Route d'Australie par le Thermomètre," with tables, by M. Hauteux; "Sur les Unités de Gauss," by M. Abria; "Le Téléphone à Bordeaux," by M. Auguste Bonel; "Notice sur les Communications Télégraphiques sous-marines," by the same; "Modification aux Machines à Force centrifuge," by M. O. de Lacologne; "Températures et Densités de l'Eau dans l'Estuaire de la Gironde," by M. Hauteux; "Vérification expérimentale des Lois de Dalton relatives à l'Évaporation des Liquides," by M. E. Laval. M. P. Tannery contributes one of his useful critical notes, this time "Sur une Critique ancienne d'une Démonstration d'Archimède." The criticism is contained in § 36 of the fourth book of the "Collections" of Pappus (Hultsch's edition), and it

charges Archimedes (in Prop. 18 of his "Spirals") with solving as a *solid* problem (*i.e.* with the aid of the conic sections) the following proposition:— OMA is a spiral, of which O is the pole, OA the axis, and AC , the tangent at A , meets the perpendicular to the axis through O in C , then OC is equal in length to the circumference described with OA as radius. M. Tannery supplies the gist of Archimedes' proof, and shows that Archimedes "fait appel simplement à l'intuition et au principe de continuité." Other points of interest turn up in the communication. Dr. Sigismund Günther is engaged upon an extended inquiry into the processes employed by the ancient mathematicians in the extraction of square roots, and in the course of his work has met with some interesting results. Some of these he puts forth in his paper "Sur la dépendance entre certaines méthodes d'extraction de la racine carrée et l'algorithme des fractions continuës." The methods examined are those of Mollweide ("Commentationes mathematico-philologicæ tres," Lipsiæ, 1813), and of Alexeieff ("Sur l'extraction de la racine carrée d'un nombre," *Bulletin de la Soc. Math. de France*, t. vii. p. 167).

We have left to the last an article by Dr. Adolf Dux (translated from the *Pester Lloyd* for February 4, 1880), entitled "La Tombe du Savant." Bolyai was professor of mathematics and physics in the "Collège Réformée" at Maros-Vásárhely. No statue, nor marble mausoleum with sides covered with laudatory inscriptions, marks the spot where this *savant* lies; but the tomb, by its occupant's strict direction, is overshadowed by the boughs of an apple-tree, "*en souvenir des trois pommes* qui ont joué un rôle si important dans l'histoire de l'humanité, et il désignait ainsi la pomme d'Eve et celle de Paris qui réduisirent la terre à l'esclavage, et la pomme de Newton, qui la remplaça au rang des astres." Strangely enough, when Dr. Dux visited the tomb there hung on the tree just three apples, "ni plus ni moins."

Bolyai was not only a mathematician, he was also a poet: hence he had not only in his room a portrait of Gauss (with whom he had been associated at Göttingen from 1797 to 1802), but also the portraits of Shakspeare and Schiller.

In 1855 he wrote his own *Necrologe*, and survived its completion about one year. In this "Adieu" occur passages, some grave, and some humorous; of himself he writes, "S'il a été mauvais, la terre est délivrée de lui; s'il a été bon, il est délivré de la terre." He burned his poetical writings, and collected the ashes in a wooden cup, on which he wrote the following lines from Horace:—

"Poesis

Si paulum a summo discessit, vergit ad imum."

This is now preserved as a relic in the library of the College. Here too is shown a photograph taken after Bolyai's death. "Une noble figure, au front et au nez puissants, illuminée par la majesté de l'esprit et du sublime repos, avec de longs cheveux lisses, descendant jusqu'aux épaules. Quand on a vu ces traits, on comprend mieux le sens du nécrologe que Bolyai a lui-même écrit et suivant le texte duquel un noble pommier a été planté sur sa tombe."

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Natural Selection and Natural Theology

I HAVE just received last week's issue of NATURE from England, and find in it some remarks by Prof. Asa Gray on an